IEEE Transactions on Geoscience and Remote Sensing, GE-18, 1-180, 1980. Journal of Geophysical Research, 85, 7575-8337,

and V. I. Moroz (ed.), Venus, The University of Arizona Press, Tucson, Arizona, 1983.

trilligator, L. H. Brace, H. A. Taylor, Jr., and R. E. Daniell, Jr., The solar wind inter-action with Venus: Pioneer Venus observa-

tions of bow shock location and structure.

T. Russell, J. A. Slavin, and J. A. Wolfe, The Venus ionosphere as an obstacle to the solar wind, Adv. Space Res., 1, 47-60,

J. Geophy. Res., 85, 7625-7641, 1980. Theis, R. F., L. H. Brace, K. H. Schatten, C.

Theis, R. F., L. H. 8 race, and H. G. Mayr,

J. Geophys. Res., 85, 7787-7794, 1980b.

the Planetary Atmosphere's Branch at NASA's Goddant Space Flight Genter.

Larry H. Brace is the

Principal Investigator for

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since 1963. He is NASA

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Lawrence Colin is the

project scientist of the Pro-

Research Center and is

chief of the Space Science

Division there. He is also

neer Venus Project at Ames

nus Othiter spacecraft and Langmair probe instru-

Empirical models of the electron tempera-

ture and density in the Venus ionosphere.

Slavin, J. A., R. C. Elphic, C. T. Russell, F. L. Scarf, J. H. Wolfe, J. D. Mihalov, D. S. In-

Hunten, D. M., L. Colin, T. M. Donahue,

Eos, Transactions, American Geophysical Union

reach but persible to the direction of plate motion. Moreover, the volcanic line code at the contextion, which suggests that a relatively thick wedge of santhenosphariz retailed is necessary for the formation of subduction related volcanism. Further has a large scatter, ber some suggest a detachment of a silver of the downgoing sish. Salutions for deeper synthe sea bers consistent eith one another with the Veses for west synthe being early helitatel and generally nerval re the projections of the selections. [Fure, Salumicity, Testeslos).

J. Geophys. Res., E. Paper A80196

Vol. 65, No. 24, Pages 393-400

Not. 65 No. 24 June 12, 1984.

Fransactions, American Geophysica

consigname, P. 649nar, S. W. Socker, O. Sustan and A. Rodriguez

Using recordings From 15 portable lostreamis and slx parament stations operated duting two Field

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RESENTICIVE AND TRETONICS OF THE BUNDUCTED COCOS PLATE

O. V. Sorbsch [Unir. of Tesos Inst. Lor Ocophysics, 4920 LH. 15, Austin, TX 787511, C. Frohilch, W. Pannington, T. Matumoto

Was bave essuined talessismic corthquoke isostions reported by the IRC for the Middia Asstics togion sod selected 220 as the most reliable. These hypocenters, slong with other data are used to dolineots the structure of the subdected Cocos Plate. The rocults indicate that the Cocos Plate is subducting in these major assents. Possible teors esparating these asgmants are located beneath the Hicoys Peneinsule and benoch south-central Massico north of the Gulf of Tehuontepes. The castrol segment is well defined to depths of 200-225 km, and oppecte to be continuous. The northern and southern espessive are not as sell defined and do not appear to extend below about 100 km. We find no compailing swidence for more extensive assentation within the resolution of our data. Was also lind one vidence for ony teors associated directly with either the Tehustepeo Hidge or the Oxosoo Frequere associated directly with either the Tahuantepeo Hidgs or the Oroseco Fractura Zone. The possible snomelous bouyancy of the Tehuantepeo Ridge may be tesponsible for a slight shellowing of the Benicff some toward the norther ond of the central segment, and the bouyascy of the Cocoe Ridge say be slowing or sysn stopping subduction in the southern segment. The structure of the central segment, and the chereter of the central segment, and the chereter of voloniem elong the sto osy be related to the motions of the two overtiding plates. The precent geometry of the subducted plate is more consistent with the probable transh onnity exterior of shout The ogo, indicating that the Moth Ametican Plate is overtiding that the Moth Ametican Plate is overtiding the subduction sopo. Hiddis Ametics, Certhquebes, Benieff sons, Subduction.

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General

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permit measurements of the atmosphere and ionosphere down to the lowest altitudes consistent with aerodynamic heating and drag limitations. Onboard propulsion was used during the first two and one half Venus years (224 Earth days/Venus year) to maintain the orbit against the perturbing effects of the solar gravitational field which would otherwise have caused periapsis to rise quickly out of the atmosphere. By the summer of 1980, the initial hydrazine fuel supply of 68 pounds had been redured to 11.5 pounds, and it would soon have become impossible to keep periapsis at the desired low altitudes. At that time the PV Science Steering Group decided that the remaining fuel should be saved for the maintenance of spacecraft attitude and for orbit adjustments that might be found destrable in the future. Thus, since 1980 the orbit has risen steadily. Figure 1 shows the altitude of periapsis since orbital injection, with the solid line showing the projected alutude through 1992. Also shown is an 81 day running average of the F10.7 cm ratio noise index of solar activity and a projection of this through the next solar cycle based on the mean of sunspot numbers in cycles 8-20.

Periapsis reached 1900 km altitude in the spring of 1984 and is expected to peak in 2240 km in the summer of 1986. If no further orbit maneuvers are performed, periapsis will return to the lower atmosphere in 1992. In addition to diese changes in periapsis altitude, by that time the latitude of periapsis will have moved steadily from its original location at 17° north to a final position at about 11° south.

This rise in periapsis added a new dimension to exploration of the near Venus environment, in particular providing information on the configuration and temporal variability of the howshock and ionopause. This is illustrated no the cover (left) which shows how the or his encountered the shock and innopanse thiring the first 8 Venus years. As the orbit swept through all solar angles in each Venus year (only the noon and midnight positions are shown) it crossed the howshock (blue points) and the ionopause (green points) twice per passage. The individual crossing locations shown here were identified by the Langmuir probe measurements on the spacecraft. The solid blue and green lines represent computer fits to the measured shock and ionopause points assuming azimuthal symmetry [Theis et nl., 1980a, 1980b], while the dashed green line and question mark are intended to convey our ignorance of how far the ionosphere may extend behind the planet

. After periapsis maintehance was abandoned In 1980, the orbit rose quickly out of the day-side ionosphere but continued to encounter the nightside ionosphere on nearly every pastage. Thus, the downstream extent of the ionosphere could still not be determined. The coverage of the upstream shock also was incomplete in the data obtained through 1983. Only necasionally was the shock close enough to Venus to allow in situ sampling of its nose (sub-solar) region, and these must have oc-curred during conditions of unusually large solar wind mach number. Thus, the average location and shape of the upstream shock still cannot be determined, but can only be extrapolated from data taken at higher latitudes, assuming an overall shock configuration. Such an assumption is particularly undeairable for the nose region of a nonmagnetized obstacle like Venus. The sampling of the nose region will con-

tinue to improve, however, between 1984 and 1988 as periapsis continues to move upward and equatorward. This is shown in the yellow orbits that have been added on the cover dlustration (mlddle). The perlapsis altitude in 1986 is still slightly below the expected average nose altitude of the shock (bl which is based on the existing PVO data corresponding to solar maximum conditions. However, the Venera 9 and 10 measurements of the Venus shock [Slavin et al., 1980] suggest that the shock forms closer to Venus at solar minimum. If so, PVO passages through the dayside at solar minimum in 1988 can be expected to sample the nose region regularly and even pass entirely outside of the shock on many occasions. The data from such orbits as these will provide valuable information on processes occurring just upstream of the

A further interesting aspect of the shock sampling expected in 1986 is also evident on the cover (middle). At this time the periapsis portion of the orbit and the average shock sition will be nearly coincident. Since the shock location is highly variable in response to changes in solar wind conditions and changes in the obstacle itself, on many occasions it will likely expand and contract across the orbit many times within each passage, allowing measurements to be conducted almost simultaneously ahead and behind the shock. 3ampling of the downstream ionosphere and its interface with the Venus wake will

Pioneer Venus: Evolving Coverage

of the Near-Venus Environment

long-term changes in solar activity.

Fig. 1. The altitude of periapsis 1992 (light line). Also shown is an 81 day average of the F107 cm rather index of solar activity with an extrapolation through 1992 based on the mean sunspot activity for solar cycles 8–20.

The question of what to do with the renaining fuel is a matter of frequent discussion in PV science team meetings. Small amounts of fuel are needed to maintain the spin axis attitude that is required to keep the desprin telemetry antenna pointed at the Earth. Uncertainties in the numinal fuel reserve of 11.5 lb require a conservative margin of reserve of a few pounds. Some fuel will be used in February and March of 1986 to recoient the spacecraft spin axis temporarily to permit ultraviolet observations of runner Halley as it passes near perihelion at a distance of less than 0.3 AU from Venus. However, consideration is bring given to the use of pro-pulsion, after the Halley encounter, to raise periapsis to improve and extend the coverage d the matteam bow stock and the downstream ionosphere and near wake. Each pound of propellent expended would provide approximately 40 km of periapsis change. If the data acquired between now and the summer of 1986 have not yet provided adequate coverage of these regions, enough fuel will be available to raise periapsis altitude to perhaps 2500 km If no further orbit adjustments are made,

the decline of periapsis beyond 1986 will provide the coverage represented by the green orbits as shown on the cover (right), which show periapsis continuing southward and en-tering the planet's thermosphere again in 1992. The sampling conditions at that time will differ in several respects from those in 1979 and 1980 when the first measurements of the Venus thermosphere were carried out. Periapsis will be in the southern hemisphere that time, and any interhemispherical asymmetries present in the thermosphere and ionosphere may become evident. A second and, perhaps, competing effect, will be that of so-lar activity. The level of solar activity will almost certainly be lower in 1992 than the extremely high values existing in 1979-1980' when perlapsis was last in the thermosphere. Since that solar maximum was stronger than most, ionosphere and thermosphere data were acquired under very perturbed conditions. The 1991-1992 period will provide the opportunity for observing the Venus atmohere at more moderate levels of solar activity and, importandy, using the same instruments that made the original measurements in 1979-1980. It is expected that the remaining fuel will be used at that time to delay atmospheric entry and burnup as long as possi-

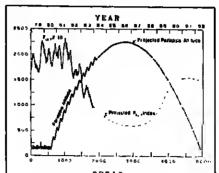
We should add a note of caution, however. The PVO solar array has exhibited a steady decline in capability which may begin to limit the operation of the scientific instruments beyond about 1988. A variety of power saving ptions are being examined by the Ploneer pject staff, and we hope that these will perit spacecraft operation to continue a few years longer. It is quite possible that the de-clining solar activity will significantly slow the solar array degradation and permit uperadons to continue through ultimate burning in 1992. Only time will tell, but in the meantime the science team looks forward with great anthe thing to several more years of exploration on this exoting journey through the outerenvironment of our sister planet.

Acknowledgments

Space Flight Center for his creative program-

angles.

A very low periapsis altitude was selected to sphere will often extend nunch further downstream than even the 1986 nibits will reach. But the data obtained during thu interval (corresponding to the declining portion of the sular cycle) may be of great value in exploring the response of the tail ionosphere and the near night-side wake of the planet to



through January 1984 (heavy line) extrapolated through atmospheric entry early in

project scientist for the Ga-<u>Yews</u>

References

EEZ Bathymetry: Ship Time **Opportunities**

A recent interagency agreement offers the prospect of ship time for federal and nonfederal researchers. Under the agreement, recently signed by John V. Byrne, Administra-tor of the National Oceanie and Atmospheric Administration (NOAA), and Dallas L. Peck, Director of the U.S. Geological Survey (USGS), the twn federal agencies have agreed to a joint program of bathymetric mapping of the U.S. Exclusive Economic Zone (EEZ) (Eat, June 12, 1984, p. 393). These cruises will present the opportunity for other investigaors to gather data in conjunction with the netric surveys.

NOAA ships, employing modern multi-beam sonars and the best available naviga-tion, will conduct the field surveys and process the data. The data and other products will be used by NOAA for their nattical charting program and by the USGS for their geological and geophysical marine map se-nes. NOAA plans to produce a new series of high resolution bathymetrle maps based on these data. The data will also be available to others via NOAA's data center in Boulder (National Geophysical Data Center, 325 8roadway, 8oulder, CO 80303).

Two NOAA ships are involved in this program. The Surveyor is equipped with the Sea-beam system, which is configured for deep-water surveying; the Davidson is equipped with a system made by the same manufacturer (General Instruments), known as BSº (Bathymetric Swath Survey System). The B35 has a broader swath width (approximately 250% of water depth versus 75% of water depth for the Seabenm) and higher frequen (36 kHz versus 12 kHz) which makes the BS5 most tiseful for shelf and upper continental slope surveys. After test and slinkedown craises (Surveyor's In May; Davidson's in September) and pending budget approval, NOAA plans to devote all of Davidson's and two thirds of Surveyor's time to EEZ bathymetric surveys starting in FY 1985.

Current plans call for the two NOAA ships to work off the Pacific Coast of the "lower 48" in FY 1985 and 1986. The initial focus will be on the outer continental shelf, the continental slope, and the upper rise. Track lines will be adjusted to provide complete coverage with the swath systems. After completion of the Pacific EEZ surveys, the ships will begin work off Alaska and Hawaii alternating on the basis of seasonal weather and ice conditions. Other Pacific islands covered by the FFZ proclamation will be included in subsequent years. No firm plans have yet

News (cont. on p. 402)

SITO Structure of the lithesphere THE SOLE OF AN INTRACRUSTAL ASTREBOSPHERS ON THE BEHAVIOR OF MAJON STRUCK-BLIP PAULTS University, there, New York, (4853), It is need to the San Andrass Such and the San Andras Such and Such and the San Andras Such and J. Guephys. Ess., B. Paper 480661 Information Related to e allow up to 6 weeks for cha lected if mailed. Only one no ad for AGU membership reco 3U subscriptions. **Return if** et, with label, to: American Geophysical Union 2000 Florida Avenue, N.W. Mashington, DC 20009 Geologic Time

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Climate Processes and Climate Sensitivity (1984)

L. H. Brace

Greenbelt, MD 20771

L. Colin

Laboratory for Planetary Atmospheres,

NASA, Goddard Space Flight Center,

Space Science Division, NASA Ames Research Center, Moffett Field, CA 94035

Since December 1978, the Pioneer Venus

Orbiter (PVO) has been orbiting Venus once

every 24 hours in a near polar, highly eccentric orbit with apoapsis of about 12 Venus ra-

dü and a periapsis as low as 1:10 km. The

spacecraft carries instruments for remote

measurements of the surface, the atmo-

parameters. These instruments were de-

dedicated issue of the Journal of Geophysical Research [1980] clescribed the mission, its

sphere, and the clouds of Venus, as well as instrumentation for in situ measurements of its thermosphere, ionosphere, and magnetic

field environment and the incident solar wind

scribed in a special issue of the IEEE Transac

tions on Geoscience and Remote Sensing [1980]. A

goals, and many of its early scientific results. The Venus book [Hunten et al., 1983] present-

ed many review articles that summarized the

more complete results and analysis available

at that time. Two of the several major goals

of the mission have been to perform explor-

atory measurements of the upper atmosphere

the interaction of the solar wind with the at-

mosphere of such an unmagnetized planet.

to the way in which secular changes in the

PVO orbit are permitting these goals to be achieved. Note that we have addressed only

the effect of orbital evolution only upon the

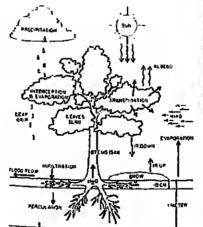
measurements of cloud patterns and ultravio-

let emissions from the atmosphere will bene-fit from both the lnng baseline of observing

in situ measurements. Clearly, the remote

The purpose of this paper is to call attention

and ionosphere of Venus and to investigate



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News (cont. from p. 401)

been made on inriegs of the Adaptic Orean

Buth agencies enrourage consurrent "piggyback" observations and sampling during these cruises. Several existing NOAA prograins (XBT, SST, weather and lisheries of servations, and water pumping and chemical analyses for NOAA's acit! rain program) will participate in this manner. Observations must generally he compatible with underway operations, but a limited number of unstation on erations may be possible. Investigators wishing to take advantage of this ship time with a compatible experiment are enromaged to ob-tain lutther information from Donald E. Preor. Project Monager (teleplinue: 301-443-5875]. Submit written proposals to Adm. John Bossler, Nathursl Ocean Service, NOAA, 6001 Executive Boulevard, Rockville, MD 20852 (telephone: 301-443-8204).

This news item was contributed by Donald Pryor, Notional Oceanic and Atmospheric Administration, Office of Chorting and Grodetic Services, Rockville, MD 20832.

IRAS: Other **Planetary Systems**

The search is on. After IRAS (Infrared Astronomy Satellite) resolved cool (85 K), thermally emitting masses apparently in orbit around the hot (10,000 K) star Vega during the spring of 1983, considerable efforts have been made in identify other solar systems and planets. Right now observers accept any size planets, even 20 \u03c4 diameter orbiting partirles as in the case of the Vega system, as a step in the direction that rould conceivably lead to discovery of a solar system like our own. (See Eos, March 13, 1984, p. 97.)

In December 1983, IRAS results hail been processed further. Among the many results, IRAS had found another solar system, again probably with only protoplanets. The star Formulhaut, like Vega, a well-known navigational aid, has a similar protoplanetary ays-

These discoveries were made by infrared black-body entission spectrum analysis and remarkably well resolved spertrally. The resolution of IRAS is obtained by means of four arrays of infrared liltered deteriors obtaining 12 to 100 μm. The observational aperture of IRAS is not commarable to that of earthbased systems, so there was not the available augular resolution to map unit iletails of the protoplanetary systems as could be done by telescone IRAS only lasted less than 1 year, as its supply of cryogeole liquid helium evap-

A recent discussion of results of a conference on protoplanetary systems suggests that ground-based telescopes are now involved in the search as well (*Physics Today*, May 1984). Telescapes at Kitt Peak, Arizona, and Mauno Loa, Rawail, have found several prinoplane tary systems recently, and a few more were reported by the IRAS group. The grund-based telescopes are limited by wavelengths observable (2-4 µm), amospheric turbulence, water vapor, and thermal emission. They have larger viewing angles, bowerer, and can get down to an aperture of as low as onetenth are second. The systems employ speckle interferometry techniques:

The importance of the observations is now being realized. Some of the observations have been confirmed independently by the Kuiper

Airbune Observatory, which is a NASA-operated aircraft with telescope. This evidence s considered the first direct discovery of the existence of nonstellar material in orbit around a siar outside of our solar system.—

NSF Director To Resign

Edward A. Knapp, director of the National Science Foundation (NSF) since late 1982, will resign his post later this year to return to research at the Los Alantos National Laboratory. President Ronald Reagan has announced his intention to nominate Erich Bloch, tice president for technical personnel development at the 18M Corp., as Knapp's

Following formal nomination by President Reagan, the Senate must confirm Bloch as NSF director. If Bloch is confirmed, he is likely to bring to NSF the greater emphasis on engineering that the agency has sought in respunse to requests from Congress and the

neering community during the last year. Knapp will return to Los Alamos to continue his research in high-energy physics. He has not specified when he will leave NSF, according to an agenry spokesman, but has told the Administration that he would like to leave as soon as possible. Knapp was nominated for the top NSF post on November 2, 1982, and was confirmed by the Senate on April 15,

1983 (Eos, May 10, 1983, p. 372). Bloch was recommended by the National Science Board, the policymaking arm of NSF. Soard Chairman Roland W. Schmitt expressed regret over Knapp's impending departure, noting that Knapp "has made nu-merous rontributions to the nation's scientifir and engineering health during his 2 years with the foundation." Schmitt said that dur-

ing those 2 years, NSF's budget has increased 38%. "A number of important new initiatives, surh as in science and engineering education, in strengthening engineering research in ara-demic institutions, and in strengthening academic rareers for young investigators, have been started." Srhinitt added. "He has ably reflected and carried out the objectives of the

Administration and the Congress. "In recommending Erich Bloch for the NSF post, we feel confident that we I lected a worthy successor, who will continue the NSF's tradition of support to the nation's scientific and terhnical goals," National Srience Suard's Schmitt said.

gloch, a native of Sulzberg, Germany, and a naturalized U.S. citizen, has been nt IBM since 1952, when he joined the company a an electrical engineer. He has held several managerial positions at IBM, including assistant group executive for technology, director of subsystems and technology, and vice president for operations. He was elected a vice president of IBM in 1981.-BTR

In Congress: Year of Ocean

On June 8, the U.S. Senate passed n resolution (S.J.Res. 257) proclaiming the year be-ginning July 1, 1984, as the Year of the Ocean. The resolution has been sent to the House of Representatives for its consider-

The resolution echoes the title and the ob-

ectives of the national celebration of the oceans and their products, slated to begin or July I with Ocean Day (Ees, April 24, 1984, s, \$26). Specifically, the resolution requests President Reagan to issue a proclamation call-ing upon the people of the United States to observe such a celebration with appropriate

Another House-initiated resolution (H.J.Res. 478), which designated the week of April 29 to May 5, 1984, as National Week of the Ocean, was signed into law (P.L. 98-27-1)

Mercury in the Atmosphere

A source of atmospheric mercucy, which appears to be associated with marine biological activity, has been located in the equatorial region of the Parific Ocean. A tecent report of a study of mercury and its compounds confirm models of oceanic sources of mercury to the marine troposphere, but suggest that the process involved may be a good deal more romplex than previously thought. W. F. Fitzgerald, G. A. Gill, and J. P. Kim wrote in Science (244, 597-599, 1984) that their results . demonstrate that Hg interactions between the oceans and atmosphere are more com-plex than geochemical mass balance estimates

auggest."
Data notained during the research cruise of the University of Washington's R/V, T. G. Thompson, during October 1980 included shipboard determinations of total gaseous mercuty (TGM) from the atmosphere and nations of reactive merenty from mixed layer water samples. The results suggest that the upwelling and its assoriated hiological activity in the equatorial zones (4°N to 10°S) may be responsible for the observed atmospheric enhancement of TGM. Both algae and bacteria are known to be able to convert dissolved mercury to volatile vapocous com-pounds, although neither die kind of organism nor the specific process of mercury re-lease were identified in the study. The link between the measurements of mercury and a marine biological source was just the ob-

served geographic juxtaposition.

The actual compounds were not itlentified.
It was suggested that they could be in the form of an organomercury component like dimethyl mercury. This is one of the forms of mercury in the group of cumponents that are known to be synthesized biologically.

In Congress: **Upcoming Hearings**

The following hearings and markups have been tentatively scheduled for the coming weeks by the Senate and House of Representatives. Dates and times should be verified with the committee or subcommittee hubling the hearing or markup; all offirea on Capitol Hill may be reached by telephoning 202-221-9121. For guidelines on contacting a member of Congress, see AGU's Guide to Legislative luformation and Contacts (Eos, April 17, 1984, p.

June 26: Hearing on the National Minorals and Materiala Policy Goordination Act (11.R. 3717) by the Mining, Forest Management, and Bonneville Power Administration Subcommittee of the House Interior and Insular Affairs Committee, Longworth Suilding, Room 1324, 9:45 A.M. (Date changed from

TBA: Conference committee on legislation to consolidate and authorize atmospheric and satellite programs of the National Oceanic and Atmospherie Administration. Time and date to be announced. House conferees: Fuqua (D-Fla.), Scheuer (D-N.Y.), Valentine (D-N.G.), Harkin (D-lowa), Andrews (D-Tex.), Jones (D-N.C.), D'Amours (D-N.H.), Winn (R-Kan.), McGrath (R-N.Y.), Srhnelder (R-R.I.), and Carney (R-N.Y.). Senate conferees

Recent Ph.D.'s

Eas periodically lists information on recent-y accepted doctoral dissertations in the disciplines of geophysics. Faculty members are invited to submit the following information, on institution letterhead, above the signature of the faculty advisor or department chairman;

(I) the disscription little, (2) author's name,

(9) name of the degree-granting department and institution. (4) faculty advisor,

(b) month and year degree was awarded. If possible, include the current address and telephone number of the degree recipient

(this information will not be published). Dissertations with order numbers, and many of the others listed, are available from University Microfilma International, Dissertation Copies, P.O. Box 1784, Ann Arbor, M1.

A Decision Support Model for the Investment Planning of the Reconstruction and Rehabilitation

of Matiere Water Distribution Systems, F. Karsa, Den. of Civil Eng., Mass. Inst. of Tech., June

A Fully Indocual Hybral Technique for Calculat-ing Electromagnetic Scattering from Three Disen-sional Bodies of the Earth, W. R. Petrick, Dep. of Gedo, and Geophys., Univ. of Utal, March 1984.

A Grachemical Approxal of Oxidation-Reduction Patential and Interpretation of Eh Measur-ments of Granud Water, R. D. Lindberg, Dep. of Geolo, Sci., Univ. of Colo., December

A Hent-Flow Investigation of the Lepontine Alps, in the Valle Maggia Region, Ticino Canton Switzerland, R. Nulen-Hucksema, Dep. of Geology and Geophysics, Vale Univ., May 1983.

A Paleumaguetic study of the Prince William Terrane und Nixua Furh Terrane, Alaska, P. W. Plumley, Dep. of Earth Sciences, Unly, of Calif., Santa Cruz, March 1984. A Parameteir Wind-Wave Model for Arbitrary

Water Depthe, H. C. Graber, Dep. of Civil Eng., Mass. Inst. of Tech., June 1984. A Spectruscupic and Chemical Study of the Col-uration of Feldspars by Irradiation and Impurities, Including Water, A. M. Hufmeister, Geological and Planetary Sciences, Calif. lust, of Tech.

A Three-Dimensional Finite Element Model for Moule Connection, J. R. Baumgaulner, Dept. of Earth and Space Sci., Univ. of Calif., De-

Au Experimental and Theoretical Study of Seepuced Erosium in Non-cohesive Sediments, C. F. McLane, III, Dep. of Environ, Sci.,

Univ. of Va., May 1984. Analysis of Upper and Low Moutle Structure Using Shear Waves, T. Lay, Seismological Lab, Div. of Geological and Planetary Sciences,

Calif. Inst. of Tech., March 1983. Applications of Teleseismic Body Waves to Shallow Earth Structures, J. P. Stefani, Dep. of Geophys., Stanford Univ., April 1984. Be-10 in the Atmosphere and Soils, M. O. Monaghan, Dep. of Geology and Geophysics

Chemistry of Submurzine Hydrothermal Solutious at 21°N, East Pacific Rise and Guaymar Bosiv, Gulf of California, K. L. Vun Damm, Man. Inst. of Tech., February 1984.

Canstraints on the Earth's Anchestic and Asplet ical Structure from Autopoint Surface Wave, E. P. Chael, Seismological Lah., Div. of Geologi-cal and Planetary Sciences, Calif. Inst. of Tech., May 1983.

Energy Release in Earthquakes, and Subduction Zone Seismicity and Stress in Slabs, M. S. Vassilion, Seismological Lada, Div. of Geological mid Planetary Sciences, Calif. Inst. of Tech.,

Evolution of the Porphyry Copper and Sharu Deposits at Mundachwille, Guspe Peninsula, Que-bec: A Geochemical, Stable Isotopic, and Fluid Inclusion Study, K. L. Sheltim, Dep. uf Geology and Geophysics, Yale Univ., May 1982. Geology and Emptive Mechanisms of Masaya Caldera Complex, Nicarngua, S. N. Williams.

Dep. ul Earth Sciences, Dartmuth College. June 1983. Gronodwater Right Protection and Aquifer Development Management: Administrative Approaches in the Western United States, J. L. Emel, Depof Hydrol, and Water Res., Univ. of Anz.

December 1983. Halocarbons in Grunnd Water, J. H. Randall, Dep. of Hydrol. and Water Res., Univ. of

Ariz., December 1985. Holographic In-Situ Stress Measurement) Geaphysics, S. N. Carhu, Seismulogical Lab., Div. ul Geodogical and Planetary Sciences, Calif. Inst. ul Terli., June 1983.

Impacts of tiroundwater Management and Al ternative Irrigation Technologies on Water Conversation in Pinal County Agriculture: An Economic Analysis, I. A. Akpnbori, Dep. of Hydrol. and Water Res., Univ. of Ariz.,

December 1983. Increases out fluctuations in thermol ocioin at Mount Wrangell, Alaska, R. J. Motyka, Dep. of Geolo. and Geophya., Univ. of Alaska, December 1008

Intergraunter Fluid Distribution in Ofwine Liquid Baselt Systems, J. R. Pulau, Dep. of Geology and Geophysics, Vale Univ., May 1988. Interpretation of Neov-Source Ground Motion and Implications, Hsui-Lin Liu, Seismological Lab., Div. of Geological and Planetary ences, Calif. Inst. of Tech., May 1983.

ences, Calif. Inst. of Tech., May 1983.
Inversion of Body-Wave Seismograms for Upper
Montle Structure, J. W. Given, Selsmological
Lab., Div. of Geological and Planetary Sciences, Calif. Inst. of Tech., July 1983.
Long Period Regional Body Woves, T. G. Wallace, Jr., Seismological Lab., Dlv. of Geological and Planetary Sciences, Calif. Inst. of
Tech., March 1983.

Tech., March 1983. Meteorite Goncentratious and Glaciological Pe-meters in the Allon Hills Icefield, Victoria Land. Antarctico, J. O. Annexstad, Johannes Guten-berg-Universitat, Mainz, W-Germany, No-

vember 1983.

Mineral Transformations During Rock Wealtheaing, and Geochemical Mass Balandss in Forsied ening, and Geochemical Mass Balandss in M. Water-sheds of the Southern Appalachians, M. Velbel, Dep. of Geology and Geophysics, Vale

Univ. May 1984.
Miseralogy, Petrology, and Geochembirg of the Miseralogy, Petrology, and Geochembirg of the Sangihe Arc; Volcanism Accompanying Arc Art.
Collision in the Molucca Sea, Indonesia, M. G.
Collision in the Molucca Sea, Indonesia, December Morrice; Univ. of Callf., Santa Gruz, Decem-

ber 1982

Modeling the Interactions of Track Milas and Aquatic Humic Materials, W. Esh, Dep. of Civil Eng. Mass. Inst. of Tech., June 1984.

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Books

Underground Sound: Application of Seismic Waves

J. E. White, Methods in Geochemistry and Geo-physics, vol. 18, Elsevier, New York, 1983, xvi + 254 pp., \$59.50.

Reviewed by Thomas R. Margan

J. E. White concerns himself, as stated in the Introduction, with naturally and artificially generated seismir waves, the properties of the rock they travel through, and the methods used to generate and detect them. He discusses these in terms of models of earth materials which can include the efferts of porosity, layering, direction of travel, loss mechanisms, and a number of other phenomena. Although the emphasis is definitely on bore-hole methods, attention is given to surfare problems, and many of the data examples cited are aurfare recordings.

Some needed mathematical tools, surh as

Fourier transforms and convolution, are briefly introduced in chapter 1. For the most part, his stated aim is to avoid the use of vector operators and tensor notation, although the lack of these methods may cause some readers to have difficulty connerting specific relations with general presentations from odi er sources. He steadfastly sticks to this goal, but the book is still laden with imposing math. Following in chapter 2 is a general discussion of plane waves and plane boundaries. This section covers the groundwork with

which most readers will be very familiar. The meat of the effort is contained in chapters 8-6, which break the subject matter into four logical areas: models of earth materials, loss mechanisms and attentiation, waves in boreholes, and sources and receivers. Each area contains a great cleal of mathematical detail and covers the topic thoroughly. He pays close attention in his arguments to such fundamentals as causality and the physical meaning of boundary conditions. Also appreciated is his use of experimental evidence for many of the earth models introduced. The analysis of the borebnie problem goes deeply into the ramifications of the three-dimension d, elastic, and even anisotrupic behavior of the earth. The practical details were greatly appreciated by one who has concentrated on the surface seismic exploration problem, where we are just beginning to move into consideration of three-dimensional and nonacoustic models. He provides numerous insights about sources and receivers, earth materials, and alternate coordinate systems.

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Many of these have not been given the rareful attention they deserve in modeling and inigration of surface reflection seismir records. As computer costs and computation times drop, and other areas of seismic exploration move toward more realistic earth mndels, we should be able to learn and adapt much from the borehole theory presented

The seismic exploration inclustry is beginning to slowly acrumulate reference sources that are more narrowly directed toward individual disriplines. These sources are making the connection from more theoretical and general references to the specific classes of applied field problems, which are, in a sense, "economic geophysical" problems. The in-tended audienre has shifted toward exploration professionals and advanced graduate students rather dian to undergraduates as many nexts of the previous generation tended to be This effort fills a vital gap.

Thomas R. Margan is with O'Connor Research, Inc., Denver, CO 80202.

The Great Tolbachik **Fissure Eruption:** Geological and Geophysical Data 1975-1976

S. A. Fedotov and Ye. Markhinin, (Eds.), Cambridge Univ. Press, New Yurk, 1983, xii + 341 pp., \$69.50.

Reviewed by Robert I. Tilling

In this decade, the devastating emptions of Mount St. Helens in May 1980 and of El Chi-chón (Mexico) in March-April 1982, along with recurring signs of possible precursory arrivity at Long Valley caldera (California), have greatly increased public as well as scientific awareness of volcanic phenomena, Yet, even though the Great Tolbachik Fissure Ecuption (GTFE) in 1975-1976 was larger than any in the world thus far in the 1980's, it rereived scant notice outside the USSR hecause of its remote location in the Kamelonka l'eninsula (o)f limits to westerners) and because initial reports of it were almost exchisively in Russian. This new book, edited by Fedotov and Markhinin, now makes available to the western world information regarding the GTFE, the biggest roleanic event in the 1970's. Moreover, it was the largest basalt eruption in the Kurile-Kamchatka arc in re-cordet history and, nn a global basis, the

and at additional malling offices. Eos. Transac-tions, American Geophysical Union IISSN 0096-39411 is published weekly by

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Cover. (Left) The pattern of bow shock (blue points) and ionopause (green points

locations identified in the Langmuir probe

spacecraft, with the noon and midnight

orbits (red lines) superposed to illustrate the coverage achieved drus far. The blue

and green lines represent empirical mod-

els of the shock and ionopause based on these data following the method of Theis et

tained thus far does not permit the loca-

the downstream ionopause to be defined experimentally. (Middle) The expanding

orbits through 1986 have been added (yel-

low) to illustrate the enhanced coverage o

the shock and ionopause diat are expected if no further propulsion is used to raise (or lower) penapsis. The bowshock is expected to move slightly closer to Venue at solar minimum, and this will improve the

coverage of the nose region. (Right) The contracting orbits through 1992 have been added (green) to illustrate the coverage of Venus during the period of rising solar

activity expected between 1986 and 1992,

The movement of periapsis from the northern latitudes in 1979-1980 (red

lines) to the southern latitudes in 1992

(green lines) will permit any interhemi-

and lonosphere to be examined.

this issue.)

pheric differences in the thermosphere

(Cover courtesy of L. H. Brace and L. Collin.

See their article, "Pioneer Venus: Evolving

Coverage of the Near-Venus Enviconmen

tions and shapes of the upstream shock or

data from the Pioneer Venus orbiter

al., [1980a, b]. The orbital co

The Weekly Newspuper of Geophysics

most voluminous outpouting of basalt since the 1783 Laki fissure eruption in Ireland.

Ploskiy Tolbarhik is part of the Klyuchevskaya group of volcanoes in rentral Kainchatka, an imposing trunrated conical strurture that rises about 2000 m above its sutroundings. It is the only basahic volrano in Kamcliatka and behaves much like the intraplate shield volranocs in Hawail, in spite of its location in a conretgent-plate tertonic setting. Extending from its summit are broad NE- and SSW-trending zones (containing abundant open fissures, cinder rones, and vents) structurally analogous to the "rift zones" of Kilan-ea and Mauna Loa Volcanoes in Hawaii. Before the 1975-1976 activity, the summit caldera contained a pit crater, about 300 m wide and 150 m deep, in which a lava lake was periodically artire.

The GTFE began the morning of July 6 from a fissure cent in the SSW-rift zone about 18 km from the summit, following an intense seismic swarm June 27 to July 5. Vigorous activity at this site (later ralled the Northern Breakthrough) continued until September 15, during the course of which were produced 8-12 km high cruption colunins, voluminous lava flows, and three rinder cones with heights of 330, 300, and 150 m. The volume of materials erupted during this period was about 1.3 km³.

Preceded by another strong seismic swarm (September 1-17), the eruption resumed un September 18 along a 600 m fissure about 10 m southwest of the Northern Breakthrough. By the next day, vent activity became concentinted near the suithern end of the fissure. Eruptive artirity, preduminantly extrusive had intermittently explosive, in this area (the Southern Breakthrough) thea continued virtually nunstop until December 10, 1976. The eruptive style at the Southern Breakthrough was "Hawaiian" and included "currains of fire," lava fuuntains, palmehoe and aa flows, and lava tubes. An additional 0.5–0.7 km of basalt was crupted, bringing the total rolume erupted to about 2 km. The shift of activity from the Northern to

the Southern Breakthrough was preceded by major collapse in early August 1975 of the preexisting summit crater of Ploskly Tollarhik. Piece-meal collapse of the summit crater persisted muil the end of 1975, enlarging it to a diameter of about 1.7 km and a depth of 0.5 km or more. Seismic and geochemical data suggest that the magnistic and emptive onxesses operative illuring the GTFE seem to closely resemble those for many Hawaiim ernptions, despite widely contrasting plate-tectonic settings for Hawaii and Kaurchatka. Secause analysis of scismic data predicted the GTFE emption several days in advance,

the Institute of Volcanology of the Academy of Sciences of the USSR was able to field a small, multi-discipline team of scientists to expand the seismic network, to begin the task of eatablishing other monitoring networks, and in visually and photographically docu-ment the eruption from the statt. The reaults of ensiting systematic studies of the entire eruption were published in Russian in 1978 as a symposia volume (Geologicheskiye i geofiziheskiye danayye a Bol'show treschianom izverz-

henii 1975–1976 gg, Nauka Press, Mosrow). The present book is a superb and quite readable translation of the 1978 symposia volume, by the Cambridge Arctic Shelf Programme translation team. It consists of 25 papera summarizing the results of geologic, geo-chemical, and geophysical studies, not only of the GTFE itself but also of the general geology, tertonics, petrogenesis, and crustal studies of the Tolbachik region. An additional interesting paper describes the establishment in 1935, and subsequent growth, of the Kum-chatka Volcanological Station, which ranks

among the world'a best volcano observatories.

Although the legibility of some of the illustrations could be improved, most are excellent and infurmative; an index for the text, as well as a large-scale innlex map of Ploskiy Tolbarhik and vicinity, would aid the reader and should be considered for subsequent editions of the hook. The prediction of the GTFE is allimled to in several papera, but nowhere in the hook is given the information or reference(s) regarding its hasis and statistical uncertainty, when the prediction was made. and how it was confuniticated to authorities and the public. The inclusion of a paper spe-cifically discussion the reportedly successful prediction would have further increased the usefulness of the book and would have ailcanned the embryonic acience of volcanology. in which most eruption forecasts and predictions are still more art than science.

The publications of this hook provides to the nun-Rusian reading volcambogists and other interested scientists a caluable data base for one of the most significant volcanic errortions in recent decades. The book contains much grist for evaluation of models of hasalroleanism at ronvergent plate boundaries. particular, it should spor comparatice studies of the processes of the generation, strange, transport, and empition of basaltir magma in diverse tectonic settings. Clearly, any serious student of volranism should acquire, or have necess to, this useful and infor-

Robert 1. Tilling is with the U.S. Geological

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minoriant consideration.

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research peogram.

Applicante should submit a vita along with a letter describing his hec research and teaching goale and the namee of five percons for reference to Professor

to act independently.

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Robert O. Reid, Head, Department of Oceanogra-phy, Texat A&M University, College Station, Texas 77843. The closing date for applications it 15 July

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Desired start date is Ottober 1, 1984. Renewal of the procedure of the initist appointment it possible, confingent upon gen-eration of additional research funding. Send resume with three referees and dissentation abstract by Au-

guit 15 to:
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University of Combridge/Theoretical Selsmologist. It is hoped soon to appoint a postdoctorate to work independently in the general field of theoretical seismology. An interest in seismic modelling and interpretation, particularly of budy-waves, would be suitable. Stimulating environment with other theoretical, refraction, teffection and earthquake seismologist. University salary. Send curriculum vitae to Professor (C.H. Chapman, Bullard Laboratories, Department of Earth Sciences, University of Cambridge, Madingley Road, Cambridge UBS OEZ, England, by 31 July 1984.

Faculty Research Assletant. Position is in the Department of Meteorology, University of Maryland, College Park. Opportunity to work with faculty in a number of research studies involving climate modelling, sartiline profilert, and meeoscale analysis. Special emphasis on graphical output from computer toolels, and diagnostic routines using meteorological d.a., including satellite and radar imagery. Graphics development will be done on a local microcomputer network and remote loss computer. Applicant must be working currently in areas of computer science, applications programming and meteorology. BS in Computer Science or Meteorology required; MS desirable. Experience in FORTRAN essential; experience in UNIX, Pascal and Clanguage desirable. Appointment is for one year with renewal opportunity, Salary negotiable within range of \$18,000 to \$30,000. Comact Dr. David Rodenhuis. Department of Meteorology, University of Maryland, College Park, MD 20742; telephone 301-454-2708. Applications received before July 15, 1984 will receive fult consideration.

The University of Maryland under Title 1X of the education amendment of 1972, does not discriminate of the part of the part of the proportunity. Faculty Research Assistant. Position is in the De-

rate on the basis of sex in admission, treatment of students or employment.

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Catastrophes and **Earth History**

The New Uniformitarianism

Edited by W. A. Berggren and John A. Van Couvering

"A powerful contribution. This work presents clear and persuasive positions related to 'punctuated equilibrium'-a currently controversial concept in geological history." -Allison Palmer

Based on pepers from a symposium at the Woods Hole Oceanographic Institution, this book reeveluates the concept of a uniformitarianism based only on events and processes lamiliar in human experience and mekes it clear that a radical expansion ol that concept is needed to account for striking discontinuities in geology, paleontology, and climatology.

With chepters by Stephen Jay Gould, Richard H. Benson, Peter E. Grelener, Derek V. Ager, Charles R. Denham, Norman D. Newall, Alfred G. Fischer, Erle G. Kaulfman, Anne Boersme, Leo J. Hickey, Robert H. Tachudy, J. David Archibald, William A. Clemens, Dala A. Russell, Nils-Axel Morner, S. David Webb, and Kennsth O. Emery.

Princeton Series in Geology and Paleantalogy Alfred G. Fischer, Editor P\$19.50 C\$65.00

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41 William Street, Princeton, NJ 08540

Assistant Research Geophysicist. The Institute of Geophysics and Planetary Physics or the Ocenn Research Division of the Scripps Institution of Research Division of the Scripps Institution of Oceanography are considering the appointment of an assistant research geophysicist, step 1 or 2, to join a research group conducting electromagnetic soundings of the ocean floor. Applicants should have experience with land and oceanic EM measurements, a demonstrated capacity to design and construct equipment, and the ability to carry out experiment at sea. A Ph.D. In geophysics or related aclences is required. Candidates should have some experience with the analysis and Inter pretation of EM data. Salary range is \$25,100—\$26,100. Applicants must submit n resume, coples of relevant publications, and the names of three references by 1 July 1984 to:

Dr. Alan Chave

Dr. Alan Chave
University of California, San Diego
Institute of Gcophyeics and Planetary Physics
A-025 La Jolla, CA 92093. The University of California is an affirmative ac-

Postdoctoral Fellow in Igneous Petrology. Available August 15, 1984, duration of 1-2 years. Areas of research inlude mineralogy/petrology/geochemistry of kimberlites and lunar rocks. A working knowledge of the electron micropobe is required. Please send resume, short summary of research goals and the names of three persons who may be contacted for recommendation to:

L.A. Taylor

University of Tennessec

Department of Geological Sciences

Knoxville, TN 37996

Telephone: 615-974-6018

Research Geophyalcist/U.S. Geological Survey.

The Office of Earthquake, Volcanoe, and Eagineening, Branch of Tecionophysica is soliciting interest from persons with elther a record of demonstrated ability or outstanding potential for research in one or more areas of Branch activity. The Branch of Tectonophysics carries our a vigorous program in the areas of crostal deformation, in-shu stress and plysical properties in regions of particular interest to earthquake and volcanoe hazards. Additional Branch activities inrlude laboratory mensurements of rock and mineral deformation in conditions appropriate to the crost and mande. The Branch le particularly interested in a geophysicist with expertise in the aquisition, analysis, and interpretation of crustal deformation data.

All interested persons should submit a detailed resume of education, experience, summary of interests and research intentions and an appropriate salary level commensurate with experience by 20 Jaly 1984 to:

Wayne Thatcher

Branch of Tectonophysics

U.S. Geological Survey

345 Middlefield Road, MS 977

Mealo Park, CA 94926

Should a position become revisible in the Sranch, you will be notified of the competitive Federal employment application requirement.

Micropalentologis/University of Puerto Rico, Ma-yaguez. Position open. July 1, 1984, Assistani Pro-lessor level, tenure track, \$17,820 per annum (9 momhs teaching). Ph.D. required. Duties will in-volve teaching at the graduate level courses in the discipline being considered here, supervising stu-dent research and conducting personal research. Applicanis should send curriculum vitac, a brief satement of teaching and research plans and three letters of recommendation to Ghairman, Appoint, ments Committee, Department of Marine Sciences,

University of Purcho Rico, Mayaguez, P.R. 00708. Telephone 809-812-40-10, ext. 3448.

Research Associate/Brown University. Research Associate in Planetary University Providence, Rhode Island. Experience in geologic geomorphic analysis of planetary images, study of surface geologic processes, computerized image processing, and/or quantitative geomorphology is desicable. Deadline for applications is June 30, 1984. Submit resume, manes and addresses of the references to Dr. James Head, flux 1846, 9mm University, Providence, H1 02912.

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STUDENT OPPORTUNITIES

Special Doctoral Research Ascistantables. The Department of Oceanography of Old Dominion University has several special doctoral research university has several special doctoral research university has several special doctoral research unistantable available for Fall Semester, 1984 and 1985. These carry a silpend of \$7,000 per academic year, renewable for three years. Applicant with M.S. degrees qualify fire wriver of tuition. Student Interested in chanining the Ph.D. In the areas of biological, chemical, geological, or physical occasography should semi an introductory resume to Dr. Ronald E. Johnson, Graduate Program Director, Department of Oceanography, Old Dominion University is an affirmative action equal opportunity institution.



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<u>Meetings</u>

Announcements

AGU Fall Meeting: Hydrology Sessions

History of Hydrology: Earth Science Aspects

The ACU History and Heritage of Hydrology Committee is organizing a special session on historical aspects of the geologic and geochemical study of surface water and ground water at the ACU 1984 Fall Meeting in San Francisco, December 3-7.

Because this is a first-time effort by the Committee, no restrictions on scope have been imposed in order to span a range of interests within AGU and the hydrology comnunity in general. Areas of interest include the work of individual scientists, the evolution of conceprs, and the development of techniques and methodologies. Invited papers deal with the development of equations of unsaturated flow in soils, the work of Henry Darcy, and the interfacing of kistorians and

Abstracts, in standard AGU formal, should be sent to Edward R. Landa, U.S. Ceological Survey, 413 National Center, Restun, VA 22092 (telephone: 703-860-6971) by August 15, the special session deadline. In addition, an original and two copies should be sent to Fall Meeting, AGU, 2000 Florida Avenue, N.W., Washington, DC 20009, by the September 12 abstract deadline.

Statistical and Hydrological Criteria in the Safety of Dams

The AGU Surface RunnIT Committee is organizing a special session on dam safery at the AGU 1984 Fall Meeting in San Francisco, December 3-7

During the last few years, research has been directed toward the analysis of risks and unrenaintles, risk-based design, and analysis of statistical, geotechnical, antl hydrologic is snes in the safety of dams. This session shall focus primardy un risk and hydrological factors associated with the design and tafety of dams. Papers are solicited dealing with riskbased design, quantification of risks, uncer-tainties and probabilities of failure, storhastic aperts of reservoir operation related to floorl control and dam safety, dam break problems. and hazard identification. General papers dealing with the mechanics of flow in dambreak situations may be accepted for presentation. The focus of the session will, however, be oo risk and reliability aspects of them safely. Invited papers deal with die use of ran-dom field models, probabilistic risk analysis. determination of the composite risk of failuce, risk-based tlesign, reservoir operation and dam safety, and relationships of failure probabilities to earthquakes and flood insur-

Abstracts, in standard AGU format, should be sent to U. Lall (the session organizer), Department of Civil Engineering, 3012 MEB, University of Utalt, Salt Lake City, UT 84112 (telephone: 801-581-6701) by August 15, the special session deadlitte. In additiutt, an origi nal and tivn copies must be sent tu Fall Mccting, AGU, 2000 Florida Avenue, N.W., thington, DC 20009, by the Seprember 12 abstract deadline.

Paleoflood Hydrology

The ACU Surface Runoff Committee is organizing a special session on paleoflood hydrology for the ACU 1984 Fall Meeting in San Francisco, December 3-7.

Paleoflood hydrology deals with the determination and use of naturally recorded flood data. This data may be obtained from many sources including tree rings, fluvial deposits, land forms, soils, and vegetative cover and y be used to date and quantify events daring back hundreda to thousands of years. such long-term information may be essential in evaluating flood hazards and risks in a number of situations for which only relatively short, or no gauge records are avadable. The purpose of this session is to foster interest in. and awareness of, paleoflood hydrology by providing a forum for interdisciplinary communication of recent research and applica-

A partial list of invited speakers and proposed presentadon titles for this apecial session Includes Brian Atwater, "Magnitude and Frequency of Floods from Glacial Lake Mazoula"; Victor Baker, "Recent Paleoflood Hydrology Studies in Arld and Semi-Arid Envinents", John Costa, "Fluvial Paleoflood Hydrology"; Cliff Hupp, "Dendro-Geomor-phic Evidence and Interpretation of Historically Recent Debris Flows and Floods, Magnitude and Frequency"; Robert Jarrett, "Evalu-ation of Paleoflood-Flow Estimates in Highradient Streams"; Craig Kochel,

Paleofloods in Southwest Texas"; Jurate Landwehr and Nicholos Matalas, "Do Dendrochronologic Records Exhlbit Long Memory, Michael Nolan and J. M. Donnelly, "Calastrophic Flooding Related to a Sub-Glacial:

Eruptinn of Medicine Lake Volcano."

Contributed papers are also solicited. Abstracts, in standard AGU forntat, should be sent to David Froelilich (the session organizer), U.S. Geological Survey, Gulf Coast Hydroscience Center, Building 2101, NSTL. MS 39529 (telephone: 701-688-1529) by August 15, die special session deadline. In addition, an original and two copies should be sent to Fall Meeting, ACU, 2000 Florida Avenue, N.W., Washington, DC 20009, by the September 12 abstract deadline.

Symposium on the Fluvial Transport of Sediment-Associated Contaminants

Contamination of fluvial and estuarine sedintents by toxic substances is a growing hydrologic and geochemical issue in recent years. Incidents such as dioxins at Timea Beach, Missouri; kepone in the luwer James River, Virginia; and PCB's in Hudson River sediments and water have received widespread attention by federal, state, and local

agencies and by the general public.

Present knowledge of toxic substances in the nation's surface waters is deficient in three main ways: (1) little is known about the nationwide occurrence, magnitude, and distribution of toxic substances on sediment particles and how these are changing with rime; (2) there is limited understanding of the physical, chemical, and binchemical processes that govern the novement and fate of different types of toxic substances under different hydrologic touditions; (3) there is uncertainty about the best study approaches, sampling techniques, and measurement methods for obtaining information about different types of toxic subnances in different hydrologic situations. These deliciencies result in crucial gaps in the knowledge necessary to safeguard limitan health and to project fish and wildlife

A symposium considering the Havial transport of sediment-associated contaminants it being organized for the 1984 Fall Annual Meeting to be held in San Francisco, Decentbec 3-7. The symposium will examine (1) the hydrologic, chemical, and biological processes that influence the morement and fate of toxic substances; (2) development of improved methods for field campling and laboratory analysis of toxic substances on sediments; and (3) detailed investigations of river basins and estuarles that describe the occurrence, magnitudes, and distribution of different types of toxic substances in various hydrologic envi-

Those interested in participating should send an abstract, in standard AGU format, to Ned Andrews, U.S. Ceological Survey, Box 25046, MS 413, DFC, Denrer, CO 80225 by August 15, the special session deadline. In addition, an original and two copies must be sent to Fall Meeting, ACU, 2000 Florida Avenne, N.W., Washington, DC 20009, by the September 12 abstract deadline.

Snowwelt-Runoff Modeling

A special session entitled "Advances in Snowmelt-Runoff Modeling" will be held dur-lng the AGU 1984 Fall Meeting in San Fran-cisco, December 3-7. The half-day session is sponsored by the Snow and Ice Committee of the Hydrology Section. Topics addressed will include (but are not limited to) the use of new technologies in snowmelt-runoff forecasting, the WMO project on infectomparison of snowmelt-runoff models, comparison of temperature-index with energy budget models, and remote sensing measurement of snow parameters.

Abstracts, in standard ACU format, should be sent to Albert Rango, Hydrology, USDA/ ARS/BARC-WEST, Building 007, Room 139, Beltsville, MD 20705, by August 15, the special session deadline. In addition, an original and two copies should be sent to Fall Meeting, AGU, 2000 Florida Avenue, N.W.,

Evapotranspiration Modeling

A special session entided "Evapotranspiration Modeling: Ita Verification and Use" will be held during the AGU 1984 Fall Meeding in San Francisco, December 3-7.

The session's invited and contributed papers will explore the utilization of models to describe ET in watershed-scale hydrology. It seeks to overcome the limitation that many models have been developed for small-scale application and are not well suited to large-scale phenomena, Principles of ET modeling over areas of many millions of kms bear special consideration, and recent advances will be covered. Remote sensing of input data for models is being developed, and operational systems will be of interest. Observations suited to large-scale application and interpreta-tion are applicable. Forested areas present special problems, and recent advances will be presented. The session is under the auspices of the Unsaturated Zone Committee of the Hydrology Section ...

Prospective contributors ahould send a. copy of an abstract as soon as possible to el-

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rher R. J. Reginato, U.S. Water Conscreation Laborainry, USDA-ARS, 4331 East Broadway, Phoenix, AZ 85040 [telephone: 6D2-661-4356) or J. F. Stone, Department of Agronomy, Oklahonto State University, Stillwater, OK 74078 (telephune: 405-624-6417), cochairmen of the committee. In addition, an abstract original and two copies must be sent to Fall Meeting, ACU, 2000 Florida Avenue, N.W., Washington, DC 20009 by the Seprember 12 abstract deatlline.

New and Emerging Issuea in Water Resources Law, Economics, and Public

The recently formed Economics and Public Policy Committee of the Hydrology Section will hold a special session at the AGU 1984 Fall Meeting in San Francisco, December 3-7.

This session is intended to address problems on the cutting edge of water resources policy and administration. Tise focus of concern is to be social and institutional rather than technical. Among the enterging issues to be addressed will be the politics of groundwater management policy, the shift of federal and state authority over water, water markets, equity considerations in water resources, and the conflicting and confusing meaning of recent court decitions on water. Lawyets, social scientists, and water practitioners are partien-

larly encouraged to participate.

Abstracts, in standard AGU format, should be sent in Helen Ingram, Department of Political Science, University of Arizonta, Tricson, AZ 95721 (telplione: 602-021-5728) by August 15, the special session deadline. In addition, an original and two cupies should be sent tu Fall Meeting, AGU, 2000 Florida Avenne, N.W., Washington, DC 20009, by the September 12 abstract deadline.

Quantitative Precipitation Forecasting Modela and Procedures Potentially Useful to Hydrologic Forecasting

A special tession "Quantitative Precipitation Enrecasting Models and Procedures Potentially Useful to Hydrodogk Forecasting" will be held in the AGU 1984 Fall Meeting under the joint sponsorship of the Hydrology and Atmorpheric Sciencer Sections This sestion will contain invited and contributed talks by hydrologists, atmospheric scientists, and operational meteorologists. Papers are encouraged pertaining to all levels of quantitative pricapitation forecast (QPF) undelting ranging from local applications to regional or untional tenmerical weather prediction applications. The models may be statistical and/or physical in nature: the basic criterion is that they uffer some potential for hydrologic applications. Also of particular interest will be papers pertaining to specifications of requirements for QPF information and the integration of QPF procedures, or outputs from QPF techniques with hydrologic-forecasting procedures. The session is being jointly organized by Konstau-tine P. Georgakakos and Michael D. Hudlow, both of the U.S. National Weather Service Hydrologic Research Laboratory.

Abstracts, in standard AGU format, should be sent to Konstantine P. Georgakakos, Hydrologic Research Laboratory, W/OHS, Nauonal Weather Service, NOAA, Silver Spring, MD 20910 (telephone: 301-427-7640) by August 15, the special session deadline. In addition, an original and two copies should be sent to Fall Meeting, AGU, 2000 Florida Ave-nue, N.W., Washington, DC 20009, by the September 12 abstract deadline.

Microbial Processes in Ground Wster: Their Role in Chemistry and

Only within the past decade has the significance of blochemistry in groundwater quality been realized. Recent studies have revealed the ubiquitous occurrence and distribution of groundwater systems, which were once thought to be essentially sterile. The research associated with the accelerated national attention to groundwater contamination and waste disposal issues has clearly shown that these organisms can perform significant roles in the chemical transformation and degradation of certain organic contaminants, such as fuel hydrocarbons, some solvents, and other organics in geohydrologic systems. Microbial acdvliy also can play a major role in nitrogen species chemistry, chemical speciation of mcials, and fixation or retardation in mobility of some dissolved contaminants. In situ biodegradadon treatment of some groundwater con taminants such as fuel hydrocarbons is now a commercially available service. However, even with these recent advances, much remains to be learned about the role of microbial pro-

cesses in the chemical quality of groundwater. In view of the rising interest, importance, and recent advances in dus subject, the Cround Water Committee, with cosponsor ship from the Soil Water and Water Quality Committees of AGU is sponsoring a special day session on dis topic at the 1984 Fall Meeting in San Francisco, December 3-7. The aession will consist of several invited pa-

pers from international leaders in this field, as well as selected volunteer papers. Topics to be included are types, uccurrence, and distribution of microorganisms in groundwater; biochemical reaction rates, kinetics, and mechanisms in groundwater; case studies of contantination problems involving biockemical transformatiun; in situ stimulation of biotransformation reactlous; groundwater and core sampling technology for biological purposes; well-clogging prublems; and other related subtopics.

Abstracts, in standard AGU format, slsould be sent to Jack Robertson, U.S. Geological Survey, Mail Stop 410, National Center, Reston, VA 22092 (telephone: 703-860-6976) by August 15, the special session deadline. In addition, an nriginal and two copies should be sent to Fall Meeting, AGU, 2000 Florida Avenue, N.W., Washington, DC 20009, by the September 12 abstract deadline.

Uncertainty in Water Quality Modeling and Management

The AGU Water Quality Committee is nrganizing a special session on water quality odeling and management at the AGU 1984

Fall meeting in San Francisco, December 3-7, In recent years, water quality modeling research has placed increasing emphasis on the consideration of uncertainty. The main focus of this session will be un the evaluation of prediction nucertainty and its effect on management decisions. Papers are solicited in the owing areas: model identification/verification, parameter estimation, prediction error propagation/reduction, statistical vis-à-vis deministic conceptual models, relevance of uncertainty in management objectives, and performance evaluation and decision/maisagement control strategies under uncertainty. Application and theoretical considerations are

encouraged equally.
Abstracts, in standard AGU format, should he sent to C. M. Marin, School of Forestry and Environmental Studies. Dake University. Durkam, NC 27706 (telephone: 919-684-2802) by August 15, the special session deadline. In addition, an original and two copies thould be sent to Fall Meeting, At(U, 2000) Florida Avenue, N.W., Washington, DC. 20009, by the September 12 abstract dead-

Computer Simulation Conference

July 23-26, 1984 Summer Computer Simulation Cunference, Boston, Mass. Sponsor: The Suciety for Computer Simulation. (The Society fur Computer Simulation, P.O. Box 2228, La Julia, CA 92038.)

The conference will feature technical papers, panel discussions, state of the art reviews, and untorials on all aspects and applications of computer simulation. The 14 topics include simulation methods, computer systems, simulation credibility and validation, physical and engineering sciences, chemical sciences, energy and resource management. environmental sciences, training and research

imulators, and artificial intelligence. Six professional development seminars (topics include Unix, new mathematical software for simulation, introduction to the C language, and continuous system simulation languages and applications) round out the

African Hydrology

July 23-27, 1984 International Symposium on Challenges in African Hydrology and Water Resources, Harare Zimbabwe. Sponsors: IAHS, UNESCO, WMO. (Zimbabwe Conference Board, P.O. Box A585 Avondale, Harare, Zimbabwe; tel.: 308222; telex: 4-283 ZW.)

The objectives of the symposium are to focus on the role of groundwater exploration data collection, assessment, resource development, and management in rural Africa, and to discuss problemss of soil erosion and sediment transport and their effects.

Among the topics to be discussed are methods of groundwater data collection, archiving, and retrieval; assessment of groundwater resources; groundwater management techniques; measurement of soil erosion and sediment yield; rate of erosion and sediment yield in the African environment; soil erosion prediction techniques; erosion problems and their control; and sediment problems and their control.

Several post-symposium tours are planned.

Natural Zeolites

August 12-16, 1985 International Conerence on the Occurrence, Properties, and Utilization of Natural Zeolites, Budapest, Hungary. Sponsor: Hungarum Academy of Sciences. (J. Engelhardt, Secretary, Zeolite 85, Central Research Institute for Chemistry,

Meetings (cont. on p. 406)

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Journal of Geophysical Research

Volume 89 Number D3 June 20, 1984

Seasonel, Lalludiaal, and Secular Variations in the Abundance and Isotopic Railos of Atmosphetic CO2
(Paper 4D0369)

Charles D. Keeling, Alane F. Correr, and Willem G. Much.
Changes in Atmospheric CO2: Influence of the Marine Biota of High Lattude Poper 4D0312)

Famy Knot and Michael B. McEiro,
Tropical Gluciers: Potential for Ico Core Paleoclimate Reconstructions [Paper 4D0091]

L. G. Utampson, E. Mostry-Thompson, P. M. Grootes, M. Pourchet, and S. Hastennith

A Model of Onygen Isotope Cumposition of Precipitation: Implications for Paleoclimata Dain (Paper 4D0086)

State of the Asthernmentally Extended Control of Precipitation (Precipitation Control of Precipitation Con

SO₂ (Paper 4D0224)

G. A. Dawson and J. Care Former

Mesn Profiles of Trace Reactive Species is the Unpolluted Marine Surface Layer 1Paper 4D03131

Anne M. Thompson and Donald H. Lenschow

Thompson and Donald H. Lenschow

On the Chemistry of Stretospheric SO₂ From Volcanie Eruptinnn (Papet 41)03181

Traveling Atmospheric Pretture Woves Mnoswied fluting n Solar Eclipst (Paper 301850)

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there is probably less than a 5t change in & over the frequency range 0.80 - 70.0 LMT.

6970 Structure of the orust and upper mentle hasing Seismic MFFACTION STOPP NETWERN CAPE SIMPSON AND PRUDON BAY, ALEXAS N. 860 (Collage of Ononnography, Oregon State Univer-

M. No (Collage of Ononnography, Oregon Sitth University, Corsility, Corsility, Corsility, Corsility, Corsility, Corsility, Collage and Caph Simpson and Frudhoe Bay, Alteba, provides date for nubsurface attructural and geological orons-sections of the vector's Beautor's Shelf. The results suggest that the wostern Beautor's Shelf in vanderials by a cedimentary prism with bads dipping and prograding to the morthant; forresition of the refraction data with waits oritised on land and offshore reflection profiles permits tentalize identification of geologic Bequences on the homes of their assauce valodity. This study mandelatts mestaurface valodities of 1.60 to 1.65 to/n with Qualernary soluents.

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composed of argitilities and paylities. West of Cape Heiwalt, the andimentary scaling is an instruction Craiosema, whereas east of Cape Estatt, Upper Cra-tomeous and Tertiery strate dominate, Higher reloci-ties id-40 - 7.07 km/ml are thought to represent the

), Gouphya, Res., b, Papot 480739

Comments on "Theory of Metomorphism of Dry Snow" by S. C. Colbeck. (Paper 4120168). R. A. Summerfeld.

Reply 1Paper 4D01671. R. A. Summerfeld.

The rleadline for sobmitting abstracts in July 31, 1984.

The program will include invited ontl subinitied papers in all aspects of natural zeolite research, including: geological occurrence, inineralingical properties, production, physical and chemical properties, biological reactivity, agricultural applications, energy conversion applications, pollution abatement applications, nuclear energy applications, and other industrial applications. An optional field trip is also being organized to the zeolite mines in the Tokaj Hills.

Photogrammetry, Surveying, and Mapping

Sept. 9-14, 1984 American Society of Photogrammetry/American Congress on Surveying and Mapping Fall Technical Meeting, San Antonio, Tex. (Monica Milan, 1984 ASP-ACSM Fall Convention, P.O. Box 8172, San Antonio, TX 78208.)

Preregistration deadline is August 10,

Five symposia will highlight the meeting. Scheduled topics are applications of remote sensing and geographic information systems in renewable rescurces; unurenewable resurree exploration and development; photogrammeter and succepting applied to transinrtation and other engineering works; state of the art cluse-range terrestrial photogrammetry and surveying; and gengraphic information systems.

New Listings

April 18-20, 1985 Continental Extenalonal Tectonies, Durham, England. Sponsor: Geological Society. (J. F. Dewey, Dept. of Geological Sciences, Durliam University, Durham DIH 3LE, Eugland.)

Sept. 15-20, 1985 Sixth International Conference on Barement Tectonics, Santa Fc, N. Mex. (M. J. Aldrich, Mail Stop D462, Los Alaneis National Laboratory, Los Alamus, NM 87545; tel.: 505-667-1495.)

Oct. 10-12, 1985 Conference on Heat and Detachment in Crustal Extension on Continents and Planets, Serlona, Ariz. Sponsor: Lunar and Planetary Institute, USGS, CSA. (Pam Jones, LPI Projects Office, Lunar and Planetary Institute, 3303 NASA Road I. Houston, TX 77058; tel.: 713-486-2150.)

Oct. 28-Nov. 1, 1985 International Conference on Coal Science, Sydney, Australia. Sponsor: International Energy Agency. (R. W. Hinde, Executive Secretary, CSIRO, Division of Fossil Fuels, P.O. Box 136, North Ryrle, NSW 2113, Australia.)

Changes:

April 16-18, 1985 Fifth Annual Front Range Branch Hydrology Daya, Fort Collins, Colo. Sponsor: AGU. (H.J. Morel-Seytoux, Dept. of Civil Engineering, Colorado State Univ., Fort Collins, CO 80523; ed.: 303-491-5448 or 8549.) Note: Change of date.

The Geophysical Year catendar last appeared in the June 5, 1984, issue of Eas.

AGU Membership **Applications**

Applications for membership have been received from the following individuals. The letter after the name denotes the proposed primary section affiliation.

Regular Members

John B. Anderson (O), Michael A. Arthur (O), John M. Boswarth (T), Gary Bowers (O), R. Jack Cornetti (11], Bruce R. Erdnl (H), Reza Klambilvardi (H), Reimhard Kirsch (I), Hu T. Liang (S), Franklin J. McDanald (S),

Bernanl G. Mendonca (A).
Andrew Nurris (S), Chris G. Rapley (O). Ennlo R. Sanchez (SM), Richard R. Standaert (T), Robert E. Stetkar (H), Sukni Sumer (H), Zhen Zhuang (S).

Student Status

Nulson Belzile (V), Craig M. aethke (H), L. Mathla Butler (VI, Nicholas G. Carras (P), Chuck DeMets (T), Arnudd G. Doden (V), John Michael Donahue (GP), Thomas Duffy (T), Charles H. Estabrook (S), Robert A. Garland (S), Nobert G. Gibson (T).

Kenneth Hardeastle (T), Neil B. Hokanson (S), David A. Jay (O), Deborah R. Jerez (V), Kari Magee (P), Nancy Mesokoras (GP), Andrea Morell (S), Richard J. Murnanc (V), Ram Muhan Narayanan (A), Regina Rapp (S), Allriam Remkin (T), Geoffrey Stothard (V). Chun Yeung Yan (T).

Separates

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Geochemistry

1410 Chamistry of the atmosphere (Carbon disside)
TREMOS OF ATMOSPHERS C. D., OVER CAFADTAN 1810
BACKGROUND STRIONS AT OCEAN MEATHER STATIOS P. SABLE
ISLAMY AND ALKET
C.S. Bong (Nartze Carbon Restarch Cantre, littless of
Comes & connex, F.O. Bon & 6000, Bidney, S.C. Canada 751
465), Y.-W. Chio, J. S. Paga, S. O. Hellagey and S. C.

488), Y.-W. Chio, J. S. Pega, S. G. Hallagey and S. C. Fattit

Tisa-meales data of atmospheric CO, concentestions are grassored for three Canadian bechground stations—Geand Wester Stution F to conthair Facility Committees and Alary, Northeast Fareltories. The mean stummal socientistics of CO, is dried samples of 336.73 ppew (1980) at Sabin 7: Isad, ffs.2d ppew (1881) at Satisfa 8: Isad, ffs.2d ppew (1881) at Satisfa 8: Isad, ffs.2d ppew (1881) at Satisfa 7: Isad, ffs.2d ppew (1882) at Satisfa 7: Isad, ffs.2d ppew 18: Isad, ffs.2d ppew 18:

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[AGO (untaturated none geochemistry)

GRIGIE AND BRITHIBUTION Of LERRON GIORIDE TO THE UNSATUPATED 2072 OF THE SOUTHERN RIGHT PLAIDS OF TEXAS

Margan Y. Mond (U.S. Geological Suevey, \$12 Nat's

Crimer, Pesten, Firginia, \$10021, Michael J. Petrollia

Pertial pressures of CO., O., M., and Ar ware monitored at two locations in the Gualisia equilar system
on the Southers High Plates of Texas. Samples were
calicied contilly during parts of 1980-1981 feem nine
deptic ranging from O. hto 13 cates helow land surlase. PCO, use theatred to be greares at depth them
in the active toll some and these appears to cortadict
into normal process is which CO, is generated in the
swil some and diffused mpward to the atmosphere med
durmward to not watur table. The 5° C of the CO, gewas quits uniform and started -17.9 per til. PO, donitioned with depth suggesting to alte generation of CO;
by the nordered to tepling the controllers were
considered to tepling the origin of the CO, at dapth.
it was nonclysied the cost probabile bypothesis was that
disable tomosphere. This hypothesis is the
disable tomosphere. This hypothesis is table to
liften the attacephere. This hypothesis is textured by
the toll, concentration prollis, taken the probable
ground water. This abundance of CO; its somewater te
ground water. This abundance of CO; its somewater te
ground water. This abundance of CO; its somewater tell
prollis, and its probable origin provide information
for evaluating she obstived needen tequesca of caliche
dissolution and precipication become to occur in the
aquifer. Iceanhoothery, Cames, Doselvrated boos, CQri
Weter Resear. Rea., Paper 440757

Geodesy and Gravity

F910 Crustel Movements
EARY MQUARE SVARY 18 LONG VALLEY CALDERA,
CALIFORNIA, JANUARY 1881: EVIPSEC FOS CIKE J.C. Savege (U.S. Geological Survey, 345 Middlefteld ford, Reale Fern, CS 94dff] and N.R.

opherham The 1982-1985 deformation observed by irilater-

connernam

The 1942-1935 deformation observed by iritateration and invaling surveys arross the tong Valing calders is apparently reternd to nhe P.1-km-beng by R-km-deep verticel repture surface affilesd by the January 1943 sarthquake swers that occurred to the south mout of the midders. The observed deformation can be empiriced as follows: In late 1952 C.03 kg. of sugma was injented into a dihe nhat dips 18 no that down-dip dimension of this dihe is 8 for The dimension of this dihe is 8 for The dimension of this dihe is 8 for The dimension of this across the perfect of the rupture surface. The description infection of the perfect of the surface of the January sweet. This reduced the frictional stress on the rupture plane and perhaps triggered the slip that recent the uppersent 2 km of the repture plane during and might the surface of the repture plane during and might bertwent deformation observed. The edditional bertwentid deformation observed. The and after the January swars manusts for the additioned berivental deforation observed. The model cas be impressed marginally if strike ally is admitted swar the astire repture swrfars and 0.006 he' of mages is injected along that swrfans in the 4tpch lonarval 2 to 0 km. The improvement in the model fat, however, is not sefficient to require shallow injection of selms at depth (R to 15 tel Alphing contributed on the model fat, however, is not sefficient to require shallow injection of selms at depth (R to 15 tel Alphing contributed because the mourgant dama plos shallow right-lenaral slip on the rupture surface is a slepla, but sot unique, applanation of the observed deforation and salesing temporary to the rupture surface is a slepla, but sot unique, applanation of the observed deforation and salesing temporary.

J. Geophys. Ren., S. Paper ABO75A

Hydrology

Difo Bration and tablmentation
MOTTON-SORMDANY CONGUTEON SDS MONIGOPILIMMIDN
TMANSERMY OF SHOTSENT

5. J. Chang iDepartment of Sachiologi
Baginaritag, Date Oniversity, Durham,
Warth Caralian, 177931

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modigatishelum tracegort of addiment it
formatical in terms of two parameters: the
Aspectican valuality cad the capatishrium
hortic consensivalian. Theoretical engracions
for the two parameters are derical Anafysical
tofoliogs to the addiment transpars squaffon for the two parameters are dericed. Amelysical tofelions to the middens transpart agnation using the generalized holten-haundary usualities in circ gious. A sumbar of provides forementione in the hottom annalities can rerigated and above to be special cases of this generalized and above to be special cases of this parametrized and above to be special cases of this parametrized bandary annalities, extralement, deposition valecity),

J. Coophys. Sed.; C. Paper 400783

BOURGARY INTEGRAL SOLUTION TO SEAWATER INTRUSION INTO COASTAL AQUIFERS

A. E. Talghesu (School of Elvil and Eastronsentni Engineering, Eorasil University, (thach, New York 14851), J. A. tiggaff and A. H-S. Chang Solutione to unatady lans-type interface and infeady wadge-type interface problems in poroun madie ern obtained. Musarieni resulfa are compared to analytical solutions for homogonomus and ionfrepto nguifere with simpli geomitins. The three-disensional squations in simpli feed to fon-dimensions uning the Oupuit-Forchtwimer apprendmenton with effour in the solitorist region is assumed static. These approximations where tented for the ematady problem by using a heperfic program and found to be valid. The present program adde to the capability of the general growedwater basin model which was based so the assa techniques. (Sewinter intrusion, aguifarm, boundary intogral equation method, coangin aguifarm, boundary intogral equation method, valut seecus. Rea., Paper 400662 J. Lieupiya. Rot., E. Paper 400784

Meteorology

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BOUNDARY LAYER FLOW CHRRACTERISTICS AT THE GEORG WOR

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REUMAYER SHIPS CHRRACTERISTICS AT THE GEORGE WOR

Ca. Kottneier linetatud für Noteoralogie u. Blimatologie

Universiest Hannover, B.-3000 Hannover, Gernamyt

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In a surface. The heldshir flow is directed to the

Borthy and ta well developed during the short cooling

portods of the months of January and tabruary. The

Iragent senterly store wied situations correspond to

a flow direction parallal to the large scale topegraphy.

A marked difference between the Leeparatures of the sir

closely showt the Lee theif and the warear sir from the

comm can be observed within the lowest 48 s.

I Georghys. Sca., C. Papes 400837 J. Geophys. Sca., O, Papes 400R37

GIIS Chamical composision
GRENATIONAL RESULTS ON THE VEXTICAL COLIDOR
ANGEMENTATIONAL RESULTS ON THE VEXTICAL COLIDOR
ANGEMENT OF ATTOSPHERIC HYBROYTI. DESCRIPTION OF ITS
SEASONAL RENATION 1977-1982 AND OF THE 1882 EL
CHICKOM FERTMERATION
CLYDE S. SUTRET and Elifambath Beaver Rerestt [MOAA
Assances, hebotatory Efg/ALS, Boulder, Coforado 800703]
OK 9482[cal column abundancet measured at Fries
Peah, Colorado (Aody, LOS9U) for 1977-87 shibbit s
gem as seasonal surbation of 285 with a January
maximum Drid a July minimum. A cessonally surybag
diurnal Saymatry of emplitude f78 about a general
72 of fact Tavoring a Featmoon abundances to allaobservato. In apring AN values accessed PN; the revarse asymmetry beide to iti. A positive parturbation of 30% to found for the summer of 1982 and la
attributed to the 31 Chichoo voicanic event in April
1935. (bydroxyl, stratospheric compositios, Irace
apaciat)

J. Gonphys. Res., R. Popet foders

1315 Firstelical Thomosoma
AMMONTHERIC JEUTHIC MUNULATION BY A SEA MOFFEE
A.C. Frevite IC.S. t.S.O. Division of Flant Industry,
P.O. Rox 1806. Combourne City, A.C.T., Australia 25011
An interess of more than 40% in boils the mean and
fluctuating price of the wheetric Todd attempts and
alreadth outrent that been observed during the days tou
development of the convective houndary layer student the
influence of the am breeze. This is estributed to
the advocation and turbulent organisation of our fool
wave general especialized. Fluctuations in the
electral analysis in the inequency range 0,001 × 1 ×
0.05 fee. Specific texticates are found to be
propositional to 1 where n = -1.05 ± 0.19. This is
compared with the -5/3 value applicable to the wind
vancets, temperature out housidity in the carfanc
layer. An outerwasion of ebett potted horizontal
ninger-mided structures in observed with this influe of
sommife. (Atmospherin electricity, charge clouds,
planetary boundary layer).
d. Geobyt, best, R. From App 31

d. Gedpbyt. Bear, R. Paper 4DP"33

Oceanography

4703 Boundary heyer and Enchange Processes
TVERELTY NAVE BOUNDART LAYERS
PART 1. MOREL POSTURATION AND FIRST-ORDER SOCUTION
John Troubvidge | Department of Civil Engineering,
University of Delevers, Newerh, Celevere, 197661,
and die secher Madese

Deallebory turbulent flow produced stur a tough
see hed by linear surface seves is analysed. An
somelogy as the vail region of steady turbulent flom
is shown to be welld very near nhe hed ted provides
the heals for a model in which the oddy visconing
he the product of a vertion; hength senie and the
first two Fourise components of a shear velocity
beand on the isatuntuneous, local hed shear acrees
with this time-verying eddy visconing voidel, an
approximate closed-feas solution for the boundary
layer first he obtained. Comparison with available
taboratory measuremental indicates that the addy
classify does in font very with these and that the
theoretical approach taken here is physically cound.
The alfact of a time-verying visconity on questicles
of presental.

J. Geophys. Res., C, Paper ACGB23

8703 Boundary Layer and Denhange Processes
TURSULARY MAVE BOURDARY LAYERS
FRARE 1. SECOND ORDER TREDRY AND HASE TRAMSPORT
John Troveridge [Department of Civil Engineesing,
Oniversity of Celevers, Newerh, Celevers, 197fs],
and die Secher Medsen
The solution for the turbolent meat-bottom
boundary Layer produced by a programative wave heahe
is novanced to socond order in save stagmass. As
the first-order analysis [Part 1], the effective
ciscosity is menumed to be the product of a vartical
length seals and the first faw Fourier components of
a phean velouity based on the hestantameous, local a shan velocity based on the hestantaments, local bed shars actuaes. An analytismi solution for the second-order fire 'held is obtained, with sctumion directed primarily toward the second-order, pave-induced steady outcomet, or mass transpore. The mass hemespore is found to depend critically on temporal veristion of the effective viscosity. The most dramatic tesuit of the manysis is a predicted rewarmed of the same transport produced by relatively inch series. This result, for which supporting experimental avidence to presented, has not been pradicted previously ted cannot be obtained by a hims-invariant eddy ciscosity model. Explications of the present wealth for velated problems are dimeased.

J. Geophys. Res., C, Paper 4C0854

AF20 Pietribution and untur massas
COASTAL TEMPERATURE AND RALIMITY IN THE MORTHERN OWLY
OF ALARM, 1970-1933
Q. Miong and T. C. Royer (inficitute of Marios Sofance,
University of Alashe, Fairbanhe, Alashe, 99701)
The analysts of the time series of the temphresors
and selimity to the ourthern Chil of Alaska from
December 1970 to April 1985 shows ended eignal to
the water propertias with earn, jow mainity surface
water to summer and cold, high ministy surface water
is lets winter. The mean significant surface water
is lets winter. The mean significant surface water
is lets winter. The mean significant surface water
over the ourself 13 year observational period; the
surface temperature, rooms was from 2 to 14 °C, and the
serfone salimity raise was 26 on file 3 'c. Almoreal
waveling throughout the water column was evident be
caused by advancion, rether than locat Affonce to
salioity anomaling to the upper 30 a are primarily
correlated with fresh hear disburgs and secondarily
afth vial stress, (Guif of Alasha, temperature
affairly, all faile).

J. Goophyn, Reg. C. Paider 407772

J. Geophym. Res. C. Paper 4CB714

4113 Ceneral (Circulation)
COARTAL FLORS DRIVIN BY A LOCAL DESSITY FLOR CUASTAL FLUIS PRIVIN BY A ISWAL DYDSITY FUNC Hetegrafil theda Impartment of Ceramography, University of British Columbio, Vancouver, P.C., VST IMS, Cenais) a twa-loyer radul with a rigid lith and a line bottom on an in-plane is complayed to actudy a line field driven by a density live through the sea surface or the coast; for example, freth water discharged from a river. The magazity is positively density live into the upper layer is represented by the water bundath (overlith totariace changing from the lower support layer to the upper lower) layer; that is, entrainment of the lower tuppari layer by the upper (lower layer. The sub-inertial liou pottern constrained by the reset has to components: one is a barcelinic addy nearby motching the entrainment region, and the other is a forcid, internal Helvin wave clong the appropriate baif of the coast. If real water discharge, addy, internal Kelvin

A THEOSEFICEL, HI BLO SHE LABORATORY STREET BY ICC-COUNTY ernon & Boulte (Beatt Polar Beasarch Ingeltate. interests of Cambridge, hensited food, Cambridge

Cof IES, Ongland .
Pield and loboratory data of ice-couples waves propagating boneath More fast les tra presented, and sis compared wird a theoretical model for tra les with allows temperature variation. Although the laboratory dataset le escentially qualitative due to acating problem, the measured wive characteristics conpare favourably with those seen in the field. The thiory fits the field detect well, both for the dispersive behavior. and for the energy decay as the ice-coupled waves penotrate the les sheat. Marcover, a maxime displactases ungasted by theory is ten in itself date for the first time, it is proposed that this peak may be tateristated the break-up of shore lest ice in exposed regions. The hearatical treatment presented assums sta les te fe thermo-regologically slaple, an untested bygathers which will require later experimental verification. Emersor, the theory is quite general and can be used to talve a veries of see ice mechanical problems where crasp to considered important, but where the loads and displacements are mult enough that linearity prevails. (Best ice, ice-coupled t. attanuation and dispersion).

Particles and Fields— Ionosphere

5305 ALISION O, (b' T - x'); ATHOSPHENIC GANG HEGHT ATROLOW MEASUREHEETS IN THE NORTHER FOLAR CA

Un (0.K. - K.-C.) ATMOSPHENIC WAND NORTHER FOLAR CAP

BESION

II. K. Hyrabé (Norwegian Go7anum Research

Establishment, H-2007, Kjalior, Norwey),

K. Haorinten, C. B. Geehr and G. J. Romich

The O2 Atmosphoric 10-1) band at 8454 has been

observed in the aligious during the 1962/89 winter

solution from the ground at Longyeardyen, West byltebargan (78.4h Lat., 15K Long, geogt. The awarau

(0-1) band Intenently for the continuous IB-hour

petiod of the observations in found to be AASE 161.

The mean temporature dedeced lead the P2 10-1) Alto
spheric band intenies attracture is found to be

15AK: SK compared to a sum on 15ASK if Y for the on

(R1) hend totalional temperature. This indicales a

shallow cotopasso with mn upper lempsroture gradies

of - I Kra. Compared to the previous observations

nhows little or no letiteds depandence, although that

is somedierable accatter in the date indicaling that

the O3 sirgiou is highly veriable in time on the

ordes of beurn or lest. (Of Atmospheric Resés.,

Poler Cap, Night sirgiou).

J. Ocophys. Rus., A, Paper 4A0770

J. Comphym. Ros., A. Paper 4A0770

fixed in dentitien and isometatures

Effect of Nor flectedus on the rolar wind

A. h. Satakat (Center for Atmosphesic and Space
Siloncon, Utch State University, Logan, Utch delin)
and S. V. Schuch

A southing is model was used to saidy the effect that
bet electron populations have on the polar wind. The
model was used to describe the stoody wate please flow
cloud diverging pomengent is field lines in the cel(telonican rogized at high attituden. The please centained of and it lone and both hot and cold electron
populations. Several but electron population with
made populations. Several but electron population with
none point aquali. Kettarde of lot effective parametrs
haved on sharecturistic oudry, and liux measurements
haved on sharecturistic oudry, and liux measurements
indicate than sinc hot/weld wiettron temperature tail
cories from 10 - 10th and that the percentage of hot
microne varies from 11.18 to 10t at 4500 bm. for
relies at the lower under these ranger, the polar
wind solutions with low olectrons are similar to their
what shade proviously for supermount a station without
hot similar to the investment of hot electrons, there is a
distontimity in the hineric solution, which institute
the presence of a miner termination. This arrestition
the presence of a miner termination. This arrestition
corresponds to a constact surfons between the box and
redictions and investment their samer. The
prosence of the lost electrons acts to fearers the
supermous (it is not low concerns the investment in the or energy
and provented borrier, thereby altoning onto 0' year to
sease, A significant enhoncement in the 0' secape
flux and occur depending on the bet electron density
and comparenture.

J. Geophys. Sea., A, Faper faddox

J. Gouphys. Sus., A, Paper 4Ad803

5540 for dunsities and remperatures
RESULTS OF A COMPENHENSIVE STUDY OF THE PHOTOGRAPHI
OF B. IN THE FUNCSIPHERS
Nadad A. Abdou (Conter for Atmospheric and Spect
Nadad A. Abdou (Conter for Atmospheric and Spect
Sciences, Utah Store Delvorainy, togan, Utah & Latis
A. B. Terra and S. Latis
form. nciences, Utah State Dulvorainy, togan, utamber, and a to geth D. C. Torr, P. O. Sinherds, M. S. Torr, and a to geth D. C. Torr, P. O. Sinherds, M. S. Torr, and a to geth D. The disagreement between model naiselections of some papers of the physical property of the spheric Ry concentrathens and hases ownswired by the spheric Ry concentrations and included as a state of the order of visit and require an additional loss of the order of visit and require an additional loss of the order of visit and require an additional loss of the concentrations of AT deep, we have drawn the conclusion that orbits of AT deep, we have drawn the conclusion that exhibits of AT deep, we have drawn the conclusion that allowed the tomospheric dissociative recombination enhancing the tomospheric dissociative recombination of the conclusion of the continuous properties of the continuous continuous properties achieved by new conchanisms which either independently are concluded an account for the observed My community that from the observed My community. the first is the onhanced destruction of \mathbf{z}_2^+ by theresembergs of wibrationally excited \mathbf{z}_2^+ with 0.

 $a_2^+(x)_{\gamma>0} + o + k + o^+(k) + k_2$

The second macheoles is the secidentally resciptivally resonant resctions

 $G^{+}(^{2}b) + H_{2} \stackrel{k_{2}f}{\underset{k_{2r}}{\sum}} H_{2}^{+}(X)_{r=5} + 0$

he uplie of the calid theoretical erguments against the pleumibility of these two mechanisms, without my pleumibility of these two mechanisms, without my years and the vanuitn! The best sgreament between theory and six with cobrained when these ten mechanisms arm combined with obtained when these ten mechanisms arm combined with cobrained when these ten mechanisms arm combined with and expert and the state of the combined of the combined combined by M. nt. a gase of the two nestinates an upper limit for the rath positions. We nestinate an upper limit for the rath positions who nestinates an upper limit for the rath positions.

J. Geophys. Res., A. Piper Adolfo.

Particles and Fields-

6940 Mhanomana wilated to marthquake pendiation REBRARCH OR THE GEORETE' On SHEME FRACTURE NUMBER FRACTURE TO THE GEORETE' ON SHEME FRACTURE NUMBER FRACTURE TO THE DAMA Q. (intitate of Geology, Retional Sursau of Rilamology, Religing, People's Sepublic of Colon) and Ehong ?.

The geometr of britishs shear fracture some staffe-silp families and abart plants in Colon. Minnate and en achelon deformational patterns are two Jundamental assaupments of leasures within british shear fracture at the 15° and the on scholoo it more than 15°. The deformation in the "noch bridge," the tark between two tesondary fractures and the sames of shear. Stam two tesondary fractures and the termination of both primary shear fractures snoot and tecoolary fractures. The direction of a limilar repirar is commonly puralish to the orientation of the principal respiration. Along the direction of peopsystion of the shear fracture, the boritousi displacement is linge, and the stewartion of Sisplaceabots it clow. The mars sum berincoptal displaceants of the shear town may be incetted in the region of the holitish fracture. Sader of retail conditions the shear fracture stones may passets pivotul movement. This type of sovenent may passets pivotul movement. This type of sovenent may be corrected or the shear fracture and the stage of the limit or by the geomethed togy of the fault seems.

J. Geophya. Res., B. Peper 480774 J. Geophya. Res., B, Paper 480774

5500 Nigh-lafitude ionospheric currents 5510 Nigh-lafitude ionospheric currents 5510 Nigh-lafitude ionospheric currents 5510 Nigh-lafitude ionospheric currents MONTOWITER DATA FOR THE CDAM-6 INTERVALS: IMPLICA 11005 FOR SUBSTORN RYNAMICS 1. Kando [Kyeto Sangya limivarsity, Kifn-ku, Kyeto 503, Japan), M. Saugiohum Using n receasly developed aumerical scheme com lined nich IRS magnetometer data and shn Ricm lini versity lonospheric conductivity redel ea input, the global diafribution of the kay (encepheric pranaters is sationaled for the EbNi-6 intervals. These culputs include ionospheric alectric Tialda and currents, fiold-aligned currents, and Augio heat production rate af high iositudes, and nra coopsind in the form of a color sovic of tin, which demonsfraten dynamics of cubstorn changen of the thren-dimensional current ayatem as well an of the montinate potential paliare. The present papers gives, on the basis of the space-line dintribution of the key paremetars, the sub stern fiden frame that come be aftered in therm of the subtlorms phases when dincunsing some other mag metospheric and ionospheric records. The dintiction beliven 'substorm expansion' and 'mchanced convection' current systems is presented on the basin of the con ventions acquired current on poteetial patters nod 'frus' forocpheric currents. Although the nurses slacifolds fider rethar configuously throughout the dark sector. Dans ern sowned separain source regions of Joule heafing from the alactive turrents. This ladistes that the relative importance of the iono special currents are article conductivity in the alactive find in tha ionotpheric currents article considerably depending upon lacitude and local files. A possible difference in the generation extendings of isolated and confineous sub storm setlytty is also distaused to some extent in the light of the two CDAM-6 intervals. (Substorm, ainctric field, eggestometer, interfice.

Ionosphere

The Megataspheria confinantion

22.2, NOSEL OF SATURE'S MAGNATIC FIELD AND THE PLOMETS

22.2, NOSEL OF SATURE'S MAGNATIC FIELD AND THE PLOMETS

2. 2. 7. Congress, S. N. Aswas, and N. F. Sean

Laboratory for Satratarratrini Physica, Goddard Space

Hight Cantar, Rrashmit. Nd 28771)

Magnatic field observations obtained by the Pionser

It vester helium segratorstar are compered with the 2,

sofis segratic ideld. Thenn fioner if observations,

obtained a foliant-to-radial distances, constitute an

importest and independent heat of the 2, wonst merconic

social, which was derived from Yorgan if and Voster 2

forgate augustocates observations. Differences

between the Pioner if esquatomatic and the 2, onder

light arm found he has seall (-1 fal) and quentifatively

tomistant with the repeated fratramental accorder, S

delified semication of these differences in spectoral

paytom coordinates shows that they are uniquely

secondated with the Instrument frame of reference and

perathon. A much beyond fit to the Pioner if

observations is obtained by relation of the instrument

secondard system about the aponeuraft apin sain by

i. If this edjustent, possibly enconsisted with

Mintrumental phase lag or roll stilleds error, the

Floater if vector helium competence or observations are

Notly occalistant with the Torgas Z, model. No

visions is found for any significant departure from

Mitymetry of Saturn's internal magnatid flaid.

J. Coophys. Res., A, Fapar 4A07dR J. Geoglys. Ros., A, Paper 4A07dR

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timen and second and control miteractics in a
ALTICOPORENI PLANA
Representation (insilated of Geophysica med Pionotary
Phytics, intermity of California, ion Angainn,
California 900261, Naha Arthour-Abdella, Yoshiharu
Gara and Kevin Gusai
The mechaniae by which hot poleotropic prolenn
pisma containing mid 8° and to 'iona in quantilativity studind. Linear geneth rates (both temporal and
sprint) are computed for different plasma parameters:
concentral ion, temperature and minutropy of cuid He'
fore and of bel protone. It is shown that:
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Sloks of the Authropogenically Enhanced Carbon Cycle in Surface Fresh Winters Paper 4D0083] Stephan Kempe Remote Senting of Weather and Climate Parameters From HIRSZ/MSU on TIROS-N [Paper #D0169] Stephan Kempe Remote Senting of Weather and Climate Parameters From HIRSZ/MSU on TIROS-N [Paper #D0169] J. Susslind, J. Rosenfield, D. Reuter, and M. T. Chuhine Effects of Oynnmical Hent Fluxes on Model Climate Sensitivity [Paper 4D0234]

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Social Sciences

1399 Genarai (Social Sciences) SHORT-HERM, SIMULE, MULTIPLE-PURPOSE RESERVOIR OPERATION: UPPORTANCE OF LOSS PUNCTIONS AND FORECAST ERRORS
Bithin Datin (Wafnr Resource a Management (aboratory, Enginearing Expartment Staffon, University of Artanana, Fayetsevillo, AR 72701) and Sad. Rargas.
A naries of synthetic inter-Acem fovecoated values (which sociaty in specified distribution of forecast errors) are used to examine operation of missiale reservoir. The quality of forecanted values is represented by the mens and variance of these errors or the coefficient of predictions (Cp). The objective function of the ophievalion model is annured to be the best possible to the provedient of candidate function of the ophievalion model is annured to be the best possible to the solution of the ophievalion ace effected eccording to the solution of the ophievalion volumes for n gigns that solution of the ophievalion volumes for n gigns that lacrament. The interage volume was then connected to reliect octaal streamflow for the forecasted period. Actual longe, deviations between motted med forecasted losses, the variance for the met forecast period. Actual longes, deviations between motted med forecasted losses, the variance of coroge and relinne volumes, and operation performance measures including well-shellity, remiliarly, and viluanability wern found to be sensitive to the relative importance given to devinitions from relinant or ntorage targets and the quality of forenacts. The performment of an operation policy head on a model that uces predicted streamflows as determined. ENDAS Bithin Datin (Wafnr Resourcea Hanagement (aboratory,

Solar Physics, Astrophysics, and Astronomy

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